4:Grajdanzev--45 S-4 (no date) 1942 Formosans
116, 312, 471, 655, 177.31 Japan
636.31

"In any case the success in irrigation should be recognized as conspicuous, and it is not less striking that it was achieved with the relatively modest investment of about fifty million yen by the state since 1908. But the state has gradually withdrawn from the field, leaving irrigation works to private enterprise and to special irrigation associations. In 1937 the irrigated area was divided among three groups as follows: 140,500 ko were irrigated from the public canals, 132,000 ko from canals belonging to private persons, 259,000 ko from those of irrigation associations. The last are under the influence of landowners and of the owners of enterprises processing agricultural products."

4:Grajdanzev--62-63 S-4 (no date) 1942 Formosans
116, 241, 312, 471, 177.24 Japan
636.24

"By putting irrigation works at the service of the farmers (at a price) the government, the local bodies, and the companies [63] impose a condition that a certain part of the newly-irrigated area should be devoted to sugar cane. This stipulation may be to the advantage of the farmer or to his disadvantage, but it is clear that he is not free to decide."

8: Chen--446 [2]
116, 175, 312

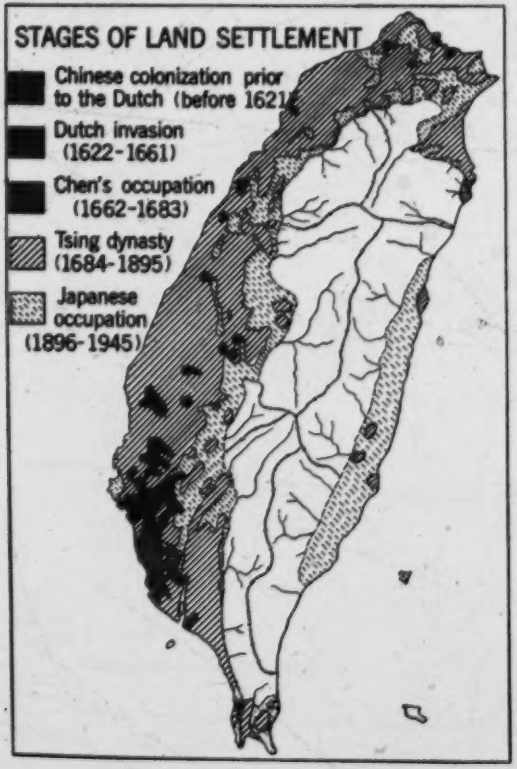
STAGES OF LAND SETTLEMENT
Chinese colonization prior to the Dutch (before 1621)
Dutch invasion (1622-1661)
Chen's occupation (1662-1683)
Tsing dynasty (1684-1895)
Japanese occupation (1896-1945)

FIG. 4

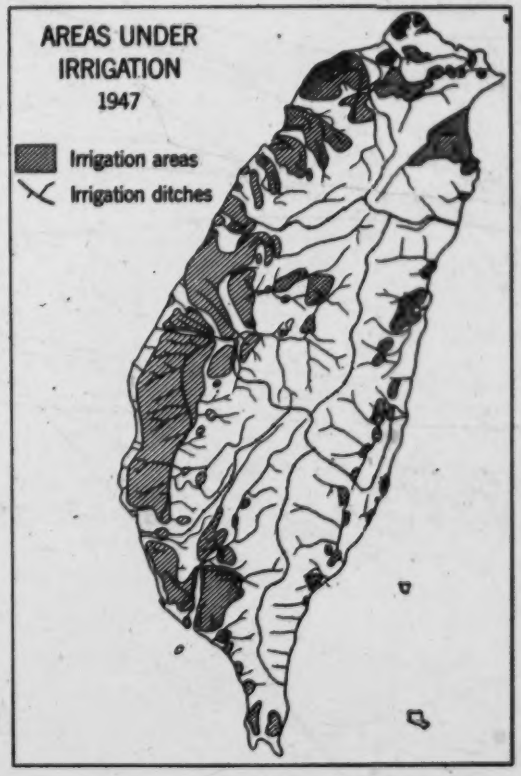

FIG. 5

"IRRIGATION

The general increase in per hectare production in Formosa in recent years is largely due to the progress of irrigation and additional fertilization, as well as to improvement of cultivation and seeding. Because of the great variation in rainfall and the location of the main agricultural region on the western coastal plan, where the winter is extremely dry and the dry season is long, irrigation is necessary. On the other hand, in summer, especially when typhoons pass over the island, the precipitous topography results in floods. The northeast corner, facing the northeast winter monsoon, has plenty of rain the year round; in fact, in many places the winter rainfall is greater than that of summer, and floods are not infrequent. Consequently, drainage and flood control are as important as irrigation."

8: Chen--455
116, 241 312

TABLE VIII—AREA UNDER IRRIGATION AND DRAINAGE IN FORMOSA
(*In hectares*)

YEAR	CULTIVATED AREA	IRRIGATION AND DRAINAGE	%
1903	534,157	150,456	28.2
1910	674,100	226,706	33.6
1920	749,419	305,270	40.7
1930	812,116	441,477	54.4
1940	860,439	530,113	61.6
1948	863,156	505,933	58.6

TABLE IX—CULTIVATED LAND UNDER IRRIGATION AND DRAINAGE, BY HSIENS
(*In hectares*)

HSIEN	1940 AREA	1940 %	1948 AREA	1948 %
Taipei	43,801	46.77	47,728	52.80
Hsinchu	89,077	60.02	56,269	37.37
Taichung	120,323	69.93	102,654	58.49
Tainan	178,612	66.70	222,160	85.10
Kaohsiung	77,194	60.62	61,500	46.60
Taitung	7,508	43.21	5,907	28.53
Hwalien	13,598	50.73	9,715	37.98

8: Chen--455-456
116, 241, 312, 177.31
636.31

N-3

(no date) 1951

Formosans--1-2
Japan

"To a certain extent, irrigation in Formosa was well developed long before the Japanese occupation. As recorded in the twenty-seventh volume of the 'General History of Taiwan' in the later years of the Tsing dynasty, the total number of irrigation reservoirs and ditches was 234. After the occupation the Japanese paid considerable attention to irrigation and drainage. In 1901 'Regulations Governing Public Irrigation Systems' were promulgated, and since then the area under irrigation and drainage has increased annually (Table VIII). In 1903 the total area under irrigation and drainage was 150,456 hectares, 28 per cent of the total cultivated area; in 1942 it had increased to 545,094 hectares, about 64 per cent of the total cultivated area. In area under irrigation and drainage Tainan is first among the hsiens (1948); Taichung comes next; then follow Hsinchu, Kaohsiung, Taipei, Hwalien, and Taitung; Penghu has no irrigation (Table IX). In percentage of cultivated land under irrigation and drainage Tainan is again highest, Taitung lowest.

Among irrigation works in Formosa, the Kianan system, in western Tainan, is the most famous. Construction was begun in 1920 and was finished in 1930, at a total cost of 54,013,000 yen. Today 140,000 hectares of cultivated land are irrigated from the Chenven and Chuhsiu Rivers. Since completion of the Kianan system, land price and land rent within its irrigating area have greatly increased. In 1920 the average land price was

313 yen per hectare, in 1935 it was 1144 yen; land rent rose from an average of [456] 36 yen per hectare to 128 yen; and the value of the yield per hectare increased from an average of 90 yen to 361 yen.

Before the Kianan irrigation system was completed, the average per hectare yield of the rice grown in the western part of Tainan was only 19 quintals. After its completion, because there were still limitations on water supply, paddy rice was grown with sugar cane and sweet potato in a three-year rotation; the yield increased to 27 quintals per hectare. The annual profit on paddy rice, when grown alone, had been 194 yen, totaling 582 yen in three years, but the profit on the rotation was 524 yen for the first year, 272 yen for the second year, and 454 yen for the third, totaling 1250 yen — more than twice the original three years' profit."

9: Yamasaki--227-228 N-5 (1896-1897) 1900 Formosans
116, 133, 312, 505

The Tamsui-kei, which together with its two tributaries on the right-hand side, the Shinten and Kilung, flows through the fertile plain of Taihoku, is important not only for watering the fields but also in communications. At its mouth lies the harbor of Tamsui, already mentioned. From there there always travel many Chinese ships and river steamers 20 km. farther up the river to Tai-tō-tei (Tautuatea), which is the largest freshwater port of Taiwan and is quite close to the capital of Taihoku. The trading vessels [228] can travel another 20 km. to the southeast as far as Taikokan (Takoham), a small town on the border of the native territory. The surroundings of the town of Taikokan are well known for camphor and other forest products. So one can always see many small boats with these products traveling from there to Taitotei on the swift flowing Taikokan-kei. The largest tributary of Tamsui-kei is the Kilung-kei. It flows through a longitudinal valley in the Tertiary range of Sanshōrei, a famous battlefield and a difficult mountain pass. It is about 60 km. long and navigable over most of its extent. Along the upper course of the Tamsui-kei river there are gold fields and bituminous coal deposits. The port of Kilung also lies quite close to the side of a small hill on the river. Thus this small but voluminous river also has considerable importance for transport in this region, where the roads leading into the country are in a bad condition.

10: Schumacher--223 [3] T-1 (ca. 1896) 1898 Formosans
116, 312

A good deal of stagnant water is found in all villages. Wells are located close to the dwellings which can thus easily be reached by the bacteria. The water of the wells is ordinarily clear but contains such a high percentage of animal salts that they are rendered unhealthy and disgusting.

10: Schumacher--224 T-1 (ca. 1896) 1898 Formosans
116, 241, 312

It has been mentioned that the agricultural population of Formosa is almost exclusively concerned with the cultivation of rice. It is indeed, the extensive cultivation of this product that has changed the character of the climate of Formosa. All the land utilized by rice fields is repeatedly flooded and very ingenious systems have been devised to assure an even distribution of the regularly flowing water of irrigation. The water trickles along in the most intricately arranged channels and often hydraulic engines are used in order to direct the water from one field to another. This continues until the heat of the sun has done away with all of it and the humidity of the air has been increased considerably. The Chinese bring all their manure and refuse to the area surrounding their settlements and therefore the air is most unhealthy and dangerous right there.

15: U.S. Navy--28 [12] (no date) 1944 Formosans
116, 312, 361, 311

"Availability of water supply (less favorable in the south) has also helped determine these settlement types. The fairly even distribution of rainfall throughout the year in the north makes springs and wells more constant and obviates the necessity of building near a permanent pool or deep stream. The method of land reclamation had an effect, too. Early militia, stationed in compact settlements, guarded the colonizers during the Koxinga period (early 17th century), and the soldiers themselves spent considerable time cultivating the land. The northern lowland districts, however, were developed in later years by private enterprise rather than by government policy. Ambitious land operators undertook to secure and clear areas unclaimed by the government. In turn, they subsidized tenants whom they brought in from the south, settling them on good land and building farmhouses for them."

52:Barclay S-5 (nodate)1954 AD1 Formosa AD1

the Japanese undertook primarily in anticipation of long-term benefit, without being able to justify its initial cost for many years. In terms of kilometer-tons of freight carried, the railroad made only partial use of its physical facilities until late in the colony's existence.[33] This sort of schedule was also followed in establishing a system of improved roads and trails over the island. In both cases, Japanese had to bear the burden of ambitious engineering projects when they could least afford it, for basic transportation networks are more valuable as networks than they are piecemeal.

Public irrigation was a project closely tied to agriculture, and followed a different timetable (see Fig. 7). After 1895 there was no large

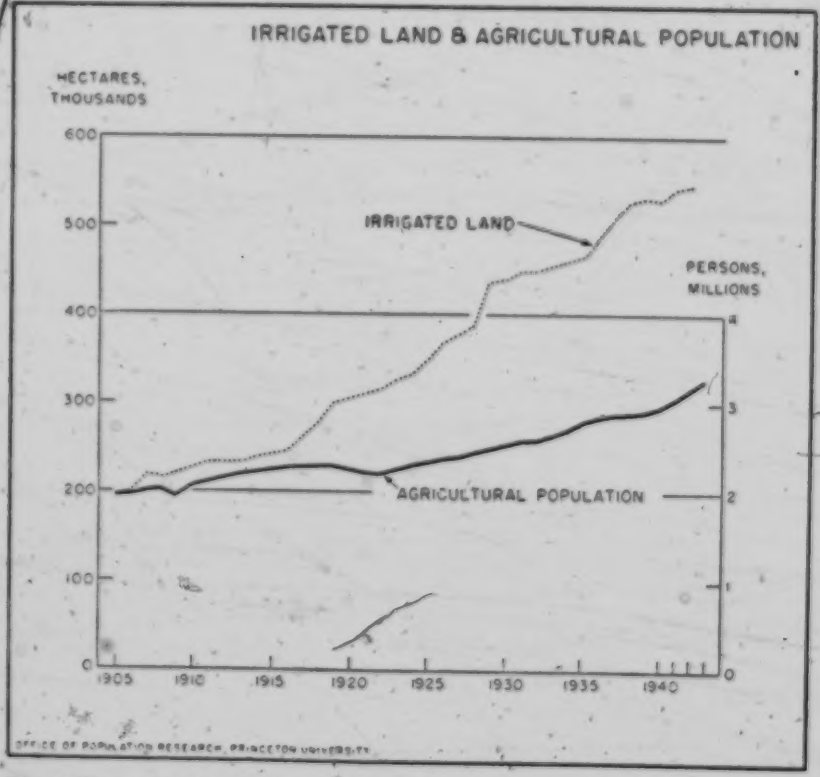

Fig. 7. Expansion of Irrigation and Agricultural Population in Taiwan, 1905-1943.

[33] Then it suddenly became overtaxed with cargo connected with the war, stemming from industrial growth and from Taiwan's role as a military base. See OPNAV, Civil Affairs Handbook, *Taiwan—Economic Supplement* (1944), p. 60.

52:Barclay S-5 (nodate)1954 AD1 Formosa AD1

supply of unoccupied land in Taiwan that could be drawn into cultivation, and so the needs of an expanding farming population and growing export demand had to be met by other means. The Japanese turned again to large investment to improve the effectiveness of the land that there was. The manner of constructing and upkeep of irrigation canals in Taiwan depended on mass labor. They were turned into an investment of labor, employed so as to produce an important form of capital equipment. The extent of irrigation more than kept pace with rural population growth while the Japanese were in control. Water for this purpose became indispensable in maintaining the output of farms. It was a hidden element in the improvement of rice and sugar yields, for the new varieties of seed that were developed were types that needed to be carefully irrigated.

Finally, the development of electric power was so closely related to the growth of Taiwan's newer industries that it should not be passed over without mention. Generation of electricity was one of the specialized heavy investments that formed the nucleus of the "industrial" progress after 1930. This is evident in a circumstantial way from the trends of capacity in generating power and the spread of factory employment (see Fig. 8). Factories in Taiwan came to depend on the cheap electricity that was developed at state instigation from water power. Judged from the size of their employment, the most important of the mechanized factories in the island were "food" (i.e., sugar) and metallurgical plants, which were the heaviest users of electricity.

As the next chapter will indicate, the Japanese broadened their objectives in Taiwan too late to put its human resources to best use in the new effort. Drawing the developed wealth of the island together into centralized control had turned out to be singularly advantageous. It had erected an entire structure of corporate organization from specialized financial services down to the coordinating of actual physical production of commodities. The Government-General had retained a close supervision over this structure, by licensing, regulation, and participation as a shareholder. As a program it quickly marshalled the production of Taiwan's farms into a profitable colonial enterprise.

When it came to pressing this development further, however, the Japanese made no real progress, for they had frustrated these aims in advance. Under agrarian conditions, industrial skills and experience in management are slower and more difficult to accumulate

1:Gallin E-4,5 (1957-1958) 1966
AD5 Taiwan Hokkien AD5
Formosa AD1

like the railroad lines, were all built during the Japanese occupation. 000 F 132 [133]

The mountain ranges serve as a kind of climatic divide. The area north of the mountains, which includes the Taipei region, is known for its long rainy season and cold raw winters. In the area south of the divide, and especially around Taichung and the interior mountain region, the weather tends to be milder, with far less rain and many days of bright sunshine.

On the trip south from Taipei to Chang-hua City the train crosses several large rivers which originate in the interior mountains and flow west to the Strait of Formosa. The rushing torrents of water during and immediately after the rainy season dwindle to a trickle during the dry season, meandering through wide, sandy, and rocky river beds. F 497 133 132

At Chang-hua City the traveler must leave the train for a bus headed southwest to the old port city of Lukang. Although the buses leave every fifteen minutes during the day, they are invariably crowded with people and their bundles of produce, fish, a chicken or two, or even building materials. F 494

The thirty-minute trip in an old wooden Japanese bus is made entirely on dirt roads. The ride may be dusty or wet according to the season, but it is always bumpy and noisy. In the dry season strangling dust pours into the bus from all sides. During the wet season, there is always a possibility that the passengers will have to leave the bus and wade while the bus creeps slowly along over the flooded roadbed. Many menthol-distilling factories, brickworks, and small rice mills line the way. The bus must cross many small irrigation canals and maneuver around oxcarts. As the bus moves further away from Chang-hua City and approaches the seacoast area of Lukang, a change in the agricultural landscape, resulting from differences in irrigation systems, becomes more and more noticeable. In those places where there is still no irrigation system, there are large areas of dry fields. F [312] [311]

After a half-hour wait in Lukang, the traveler boards another, similar bus for the trip to the village, which lies about three miles inland or southeast of Lukang. The uncomfortable fifteen-minute ride ends when the bus comes to a halt in front of the Hsin Hsing village store.

The houses in the village are constructed of bamboo, mud or fired brick, and plaster. The foundations and structural uprights are usually brick; the walls are a latticework of bamboo strips, filled in with plaster which is a mixture of mud and cow dung. The plaster filling is usually whitewashed. Sometimes the main supports are not brick but heavy bamboo poles. Newer houses, and the older houses of the wealthy, generally have roofs of cement tile, while the oldest and poorest houses have thatched roofs. Houses made of mud bricks are always thatched. T 342

1:Gallin E-4,5 (1957-1958) 1966
AD5 Taiwan Hokkien
Formosa AD1

With the advent of the Japanese in 1895, Lukang very soon lost its importance as a port, for Japan's plans for the colonization of Taiwan did not include maintaining Lukang as a trade and immigration center. The Japanese set about cutting off the movement of people and goods between Taiwan and the mainland, and, to divert the colony's trade from China to Japan, they built the port of Keelung in northern Taiwan (Barclay, 1954b:12, 18–42). The demise of Lukang both as a port and as a major urban center was hastened by the silting up of the harbor, which had begun even before the coming of the Japanese. As a result of Japanese indifference to Lukang as a port, the harbor soon became unusable.

The final blow by which the Japanese doomed Lukang's importance was the routing of the extensive west coast railroad system far from Lukang. The city could then neither be maintained as a major market town nor as a point of trans-shipment for the area's produce. Its decline as an urban center and as an influence on the surrounding area was reflected in an accompanying population decrease from one hundred thousand in the late eighteenth century to fifty-one thousand in 1954 (*Women te Lukang Chen*, 1954). The decrease took place despite the high rate of population growth in the rest of Taiwan.

Today, Lukang stands several miles from the sea, a city much diminished in size and importance. It offers little economic opportunity for its inhabitants, and despite some light industry, few village people are employed there. Nevertheless, although it is now a small, out-of-the-way city, it offers nearby villagers a convenient local marketplace and a center for some entertainment. Most important, it still functions as a religious center. From the earliest times the Chinese immigrants brought their gods with them from the mainland to Taiwan. These gods and goddesses, such as Matsu, became firmly established as important deities in Taiwan; the Matsu temple in Lukang is believed by the people of the area to be the oldest or second oldest Matsu temple on the island. For this reason Lukang is still one of the most important focal points for the religious pilgrimages of those who maintain loyalty to the Goddess Matsu.

The historical picture of this area at the time of the late Ch'ing dynasty comes from data furnished by older or better educated residents of the area and several local Chinese and Japanese gazetteers.[3] These various sources were used, wherever possible, to corroborate one another. The sources note that in the late nineteenth century the area was sparsely populated and that its inhabitants lived in constant fear of bandits. Up to the early part of the twentieth century dry farming produced most of the staples grown, since there was only a very limited system of irrigation. Crops like wheat, soybeans, sorghum, sweet potatoes, peanuts, a plant used to make dye for cloth, and broom grass were

1:Gallin E-4,5 (1957-1958) 1966
AD5 Taiwan Hokkien AD5
Formosa AD1

the main products. Rice growing played little part in the economy. The almost total lack of irrigation, presumably combined with a high mortality rate, prevented any rapid increase in population. There were not even enough people to exploit the land fully.

The present area of Hsin Hsing was at that time the site of only a few scattered households. The inhabitants were so few and so weak, and the bandits so many and so strong, that Hsin Hsing and eleven nearby villages formed a mutual protection association. When a village was attacked by bandits, it sounded large gongs as an alarm signal; the signal was relayed from village to village, and the able-bodied men rushed to the aid of the community under attack. The associated villages still maintain an informal organization today, though its function is now the production of a joint annual religious procession (which will be discussed in Chapter 8).

The coming of the Japanese to Taiwan had major repercussions not only for Lukang but for the Hsin Hsing village area generally. Once their rule was established on the island, the Japanese moved quickly to bring about law and order by suppressing the bandits. They eliminated the lawless element from the countryside and brought new security to the village people.

The Japanese also took in hand the extreme complexities of a tri-level land tenure system of landlords, tenants, and subtenants. (See details in Chapter 4.) In order to establish clear property rights and increase the efficiency of tax assessment and collection, the Japanese carried out extensive land surveys from about 1898. In 1905 the "Land Investigation Regulations" were promulgated; they resulted in a greatly simplified land tenure structure which included only landlords and tenants. This basic system is still in force today. Even in more recent years, although the Land Reform Program of the Chinese Nationalist government modified the internal content of the land tenure structure, its form has remained roughly the same.

At the same time, the Japanese gradually extended the irrigation system to serve much larger areas (see *Pu Yen Chuang Yen Ke Chih*)[4] as part of their effort to integrate the colonial area of Taiwan into the Japanese economy. The development of a major irrigation system enabled the agricultural population to expand its rice production greatly, and this rice ultimately became its major export to the Japanese homeland (Barclay, 1954b:18–42).[5]

The expansion of the irrigation system, accompanied by a greater emphasis on agriculture in the area, occurred at about the time that the main impact of the closing of the port of Lukang began to affect the villagers, who thus lost the opportunity to supplement their livelihood by working in the port. The increased irrigation meant that wet-rice could be planted profitably. Wet-rice production demands a